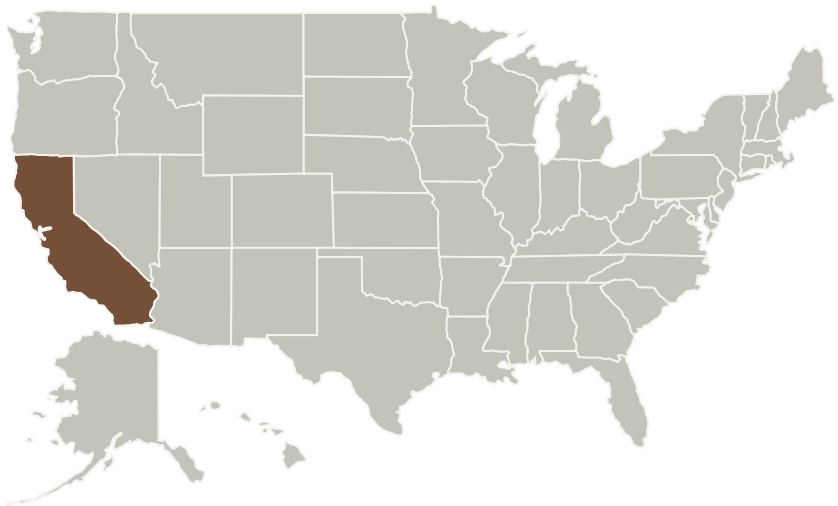
ASHI - A Light-Weight All Sky Imager for Future NASA Heliospheric Missions

Completed Technology Project (2017 - 2020)

Project Introduction

We ask the basic science question: "What are the shapes and time histories of heliospheric structures in the plasma parameters: density and velocity?" To answer this question, we propose to build and test ASHI, an All-Sky Heliospheric Imager for NASA missions whose primary applicability is to view the inner heliosphere from deep space. The zodiacal-light photometers on the twin Helios spacecraft, the Solar Mass Ejection Imager (SMEI) on the Coriolis satellite, and the Heliospheric Imagers (HIs) on the Solar-TErrestrial RElations Observatory (STEREO) twin spacecraft, all point the way towards optimum instruments for Thomson-scattering observations from space, and also for future low-light-level auroral remote-sensing. The specifications for such systems include viewing the whole sky starting beyond a few degrees of the Sun, and covering a hemisphere or more of sky. With an imager mass of about 2.5 kg per system (scalable to lower values for instruments viewing from closer than 1 AU), ten-minute exposures, 20 arc-second pointing, and low power consumption, this type of instrument has been a popular choice for recent NASA Mission concepts such as STEREO, Solar Orbiter, Solar Probe, and EASCO. A key photometric specification for such imagers is 0.1% differential photometry which enables the 3-D reconstruction of density starting from near the Sun and extending outward. A proven concept using SMEI analyses, ASHI will provide an order of magnitude better resolution in three dimensions over time. We will include velocity this concept, and for a heliospheric imager in deep space, provide a high-resolution comparison of in-situ density and velocity measurements obtained at the spacecraft, to structures observed remotely (Jackson et al., 2010, Solar Phys., 265, 257; Jackson et al., 2011, JASTP, 73, 1214).

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

Heliophysics Technology and Instrument Development for Science

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Organizations Performing Work	Role	Type	Location
University of California-San Diego(UCSD)	Supporting Organization	Academia	La Jolla, California

Primary U.S. Work Locations
California

Project Management

Program Director:

Roshanak Hakimzadeh

Program Manager:

Roshanak Hakimzadeh

Principal Investigator:

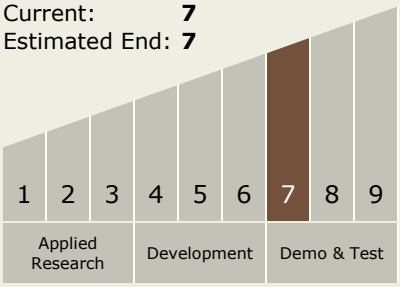
Bernard V Jackson

Co-Investigators:

Mario M Bisi
Andrew Buffington
P. P Hick
Wilma Orantes
Hsiu-shan Yu

Technology Maturity (TRL)

Start: **7**
Current: **7**
Estimated End: **7**



Technology Areas

Primary:

- TX08 Sensors and Instruments
  - TX08.1 Remote Sensing Instruments/Sensors
    - TX08.1.5 Lasers

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Target Destination

The Sun